Cost / Schedule
Executive Session

Director's CD-1 Review
of the
NOvA Project

February 28 – March 2, 2006

L. Edward Temple, Jr.

Agenda

Wednesday, Mar. 1

8:00 – 8:30 AM	Cost and Schedule Executive Session (Comitium, WH2SE)	Ed Temple
8:30 – 10:30 AM	BREAKOUT SESSIONS 1) Site and Building (Blackhole – WH2NW) 2) Commodities - Scintillator, Fiber, PVC (1 North, WH1NW) 3) Extrusion Module Production (Snakepit, WH2NE) 4) Electronics and DAQ (Racetrack, WH7X) 5) Far and Near Detector Assembly (1 East, WH1NE) 6) Management, Cost and Schedule (Comitium, WH2SE)	
10:30 – 10:45 AM	BREAK (Outside Comitium, WH2SE)	
10:45 – 12:30 PM	BREAKOUT SESSIONS – Continued (Same breakouts and locations as for the 8:30 – 10:30 AM sessions)	
12:30 – 1:30 PM	LUNCH (WH2 Crossover)	
1:30 – 2:30 PM	NOvA Respond to Committee Questions from 1st Day (Comitium, WH2SE)	
2:30 – 4:00 PM	Executive Session (Comitium, WH2SE)	
4:00 – 6:00 PM	Report Writing (Comitium, WH2SE)	

Thursday, Mar. 2

9:00 – 2:00 PM	Closeout Dry Run with working lunch (Comitium, WH2SE)	
2:00 PM	Closeout (1 West, WH1SW)	

Cost/Schedule Review Guidance

These are CD-2 Requirements.

Now at CD-1.

We should use as a guide for assessing a baseline "range" or appropriate contingency.

Project Technical, Cost, and Schedule Baseline Development

To Succeed in Cost / Schedule Arena

Estimate must be
- **Complete**
  - Scope well understood and defined
    - Technical goal must be clear
    - Technology to be used to meet this goal known
    - Designate how technical systems will be acquired
      - I.e. buy, have fabricated, self fabricated
      - Buy parts / fabricate / assemble
    - How will this be accomplished
      - Self fabricate / assemble – lab or university(ies)
      - How will person power requirements be met
        - And paid for
  - All tasks defined and specified in a work breakdown structure
  - WBS dictionary
- **Documented** at lowest level of WBS and include
  - M&S – materials and services
  - SWF – salaries, wages, & fringes
  - Accompanied by schedule showing appropriate durations
  - Adders – overheads / G&A (general & administrative)
  - Escalated – shown both with and without escalation with funding profile based on laboratory/DOE/Federal budget/appropriation guidance

Cost/Schedule Review Guidance

(Continued)

Reviewable

Estimate must “roll-up” from the lowest level to the total and reviewers must be able to drill down from the top to the lowest level

Credible

Basis of estimate must be specified

- Catalog prices
- Similar work, where cost is documented
- Engineering estimates
- WAG – wild ass guess

This material forms basis for DOE approving a baseline, for Fermilab/Collaboration Project Management to measure performance and take appropriate corrective actions during execution and for Laboratory Management and DOE to monitor progress.

Cost/Schedule Review Guidance

(Continued)

Baseline Reviews

When preparing a baseline, it can be helpful to be aware of and prepared for the types of things a Director's Technical/Cost/Schedule/Management Review Committee or a DOE Baseline Review Committee will be looking for. The following provides some insight into such reviews. Review Committees are frequently broken up into subgroups which are then assigned to look at specific systems or subprojects within a project.

To be available for reviewers one week prior to the review

- Conceptual &/or Technical Design Reports
- Design Review materials (web address was provided)
  - Materials presented at most recent design review for system
- Detailed schedule for system (to be looked at during breakout sessions)
- Cost Estimate Details for system (will be provided at low levels of the WBS)
  - Including WBS Dictionary and BOE – Basis of Estimate detail sheets
  - (BOE notebooks will be available in breakout rooms)

Tabbed hardcopies of review materials and presentations to be available at the review. Enough for committee, observers, and a half dozen extras

Cost/Schedule Review Guidance

(Continued)

Technical / Cost / Schedule / Management Review Guidelines
(things reviewers are asked to do)

Technical

Examine Design Review Materials (including TDRs & CDRs) for your system
- Assess level at which **scope is understood and defined**
- Assess level that **technical aspects of the system are understood, planned, designed, procured/fabricated and/or prototyped**

Cost

Choose >~5 top level WBS elements from your system
- *Drill down* to successively lower levels of the WBS; while at each step
  - Understanding the **scope** of that element
  - Understanding the **schedule** for that element
  - Understanding the **basis of estimate** (BOE) for **both M&S and effort** for that element
  - Choose a few elements next lowest level of the WBS
    - And repeat this procedure until you get to the bottom level.
    - I.e., the lowest level of the WBS

Choose >~5 items in the system for which you have personal experience
- Interact with the responsible managers to **determine if**
  - **The Estimate is complete, documented, reviewable, and credible**

Cost/Schedule Review Guidance

(Continued)

Check that there is **a detailed BOE for all work elements** in your system

Check whether the **estimate for your system "rolls-up"** from the lowest level WBS element to the total for your system

Does each level of the WBS contain all costs from lower level WBS elements

Assess the **"bottoms up" contingency that the WBS level 3 managers would assign** their components.

Assess the **"top down" contingency analysis assignments by the Project Manager**

Schedule

Is there a detailed schedule, including a critical path, for completing the project? Are milestones appropriate in number and type identified so that the project teams, Fermilab management, and DOE can effectively track and manage progress? Based on past experience, can the proposed schedules be met? Are appropriate schedule contingencies provided? Is there a "resource loaded schedule" and plan for providing the needed resources (M&S and technical support staff and physicists)?

Cost/Schedule Review Guidance

(Continued)

Funding

Have techniques such as forward funding by collaborators and phased funding of large contracts been appropriately incorporated into the planning? Does the anticipated funding profile support the resource requirements?

Management

Is an **appropriate / adequate project organizational structure** in place and **staffed** (or are plans in place) to do the job.

Has the **appropriate project management documentation** been prepared. Is it of a quality adequate for this stage of the project? Are **appropriate / adequate management systems** (Cost and Schedule Control System / Earned Value Reporting, Critical Path Management, Risk Management, etc.) in place or planned for use during project execution?

Reviewer Assignments

Executive Summary	Ed Temple
1.0 Introduction	Dean Hoffer
2.0 Science	Heidi Schellman, and All
3.0 Site and Building (WBS 1/2.1)	Karen Hellman, Elaine McCluskey
4.0 Commodities – Scintillator/Fiber/PVC (WBS 1/2.2, 1/2.3 & 1/2.4)	Linda Stutte, Joe Ingraffia
5.0 Extrusion Module Production (WBS 1/2.5)	Dmitri Denisov, Heidi Schellman
6.0 Electronics, Trigger DAQ (WBS 1/2.6 & 1/2.7)	Jonathan Lewis, Erik Gottschalk
7.0 Far and Near Detector Assembly (WBS 1/2.8 & 2.9)	Richard Boyce, Charlie Cooper
8.0 Project Management (WBS 1.9 & 2.10)	Mike Lindgren, Ed Temple
9.0 Cost and Schedule	Jeff Sims, Dean Hoffer,

- Note underlined names are the primary writer.

Reviewer Assignments
(continued)

10.0 Charge Questions	
TECHNICAL	
10.1 Are the requirements that form the basis for the design and engineering phase of the project clearly documented?	Heidi Schellman
10.2 Does the conceptual design satisfy the performance requirements?	
10.3 Has a Conceptual Design Report (CDR) been developed that includes a clear and concise description of the alternatives analyzed, the basis for the alternative selected, how the alternative meets the approved mission need?	Mike Lindgren
10.4 Has the Project employed value management as early as possible in the project development and design process so recommendations can be included in the planning and implemented without delaying the progress of the project or causing significant rework of completed designs?	
10.5 Has the Project identified specific standards which include codes, standards, regulations, and needed discipline (electrical, mechanical, nuclear, fire, radiation control, etc.) requirements to procure, fabricate, construct, inspect, and test the components, subsystems, and systems?	Elaine McCluskey
10.6 Can the conceptual design be built? Does the design meet the technical specifications? Is it a reasonable design?	Richard Boyce/ All

- Note underlined names are the primary writer.

Reviewer Assignments
(continued)

	COST	
	10.7 Does the conceptual design report and supporting documentation adequately justify the stated cost range and project duration?	Jeff Sims/ All
	10.8 Has the project developed a life-cycle cost estimate that includes costs for research and development, construction, operations and decommissioning?	
	10.9 Do the cost estimates for each WBS (or cost) element have a sound documented basis and are they reasonable?	
	10.10 Does an obligation profile exist?	Mike Lindgren
	10.11 Has the project established a realistic cost estimate for the work associated with performing Preliminary Design, Final Design and Value Management activities to request an appropriate level of PED (Project Engineering and Design) Funds?	Jeff Sims/ All

- Note underlined names are the primary writer.

Reviewer Assignments
(continued)

	SCHEDULE	
	10.12 Does the Project's Work Breakdown Structure (WBS) define the total scope of the project as a product-oriented family tree composed of hardware, software, services, data, facilities and other components?	Dean Hoffer/ All
	10.13 Is a schedule developed and resource loaded?	
	10.14 Are the activity durations reasonable for the assumed resources?	
	10.15 Is the schedule duration feasible for the resources assigned to accomplish the tasks?	
	10.16 Does the schedule contain appropriate levels of milestones, sufficient quantity of milestones for tracking progress and do they appear to be achievable?	
	10.17 Does the schedule include activities for design reviews, which include assessment of the designs readiness for procuring prototypes and preproduction materials?	
	10.18 Has the activities associated with the Preliminary Design, Final Design and Value Management activities been appropriated identified in the schedule so they can be properly tracked if PED funds are used?	

- Note underlined names are the primary writer.

Reviewer Assignments
(continued)

	MANAGEMENT	
	10.19 Is there an appropriate management organization structure in place with the responsibilities defined and documented for the scope of work?	Mike Lindgren
	10.20 Does the proposed project team have adequate management experience, design skills, and laboratory support to produce a credible technical, cost, and schedule baseline?	Mike Lindgren/ Ed Temple
	10.21 Are ES&H aspects being properly addressed and are future plans sufficient given the projects current stage of development?	Elaine McCluskey/ Richard Boyce
	10.22 Is the documentation required by DOE O 413.3 in order and ready for Approval of CD-1?	Mike Lindgren
	10.23 Are there adequate staffing resources available or planned for this effort?	
	10.24 Is there a funding plan available or proposed to meet the resource requirements to realize the project?	
	10.25 Has Risk Management been performed which includes risks assessments on each potential design alternative as a factor in selecting which alternative is to be pursued?	

- Note underlined names are the primary writer.

Breakout Assignments

1) Site and Building (Blake Hole, WH2NW)	Karen Hellman, Elaine McCluskey
2) Commodities – Scintillator/Fiber/PVC (1 North, WH1NW)	Linda Stutte, Joe Ingraffia,
3) Extrusion Module Production (Snakepit, WH2NE)	Dmitri Denisov, Heidi Schellman
4) Electronics and DAQ (Racetrack, WH7X)	Jonathan Lewis, Erik Gottschalk
5) Far and Near Detector Assembly (1 East, WH1NE)	Richard Boyce, Charlie Cooper
6) Management, Cost and Schedule (Comitium, WH2SE)	Mike Lindgren, Jeff Sims, Dean Hoffer, Ed Temple,

NOvA's Cost & Contingency Estimate

	WBS	Items	NOvA 's Cost Estimate AY06 $M									
			Estimated Cost (with indirects)			Contingency Estimate			Contingency %			Total Project Cost
			M&S	Labor	Total	M&S	Labor	Total	M&S	Labor	Total	
TEC	2.1	Far Detector Site and Buildings	$ 27.2	$ 2.6	$ 29.8	$ 5.9	$ 0.7	$ 6.6	22%	29%	22%	$ 36.4
	2.1	Liquid Scintillator	$ 36.4	$ 0.9	$ 37.3	$ 10.8	$ 0.4	$ 11.2	30%	42%	30%	$ 48.5
	2.3	Wave-Length-Shifting Fiber	$ 24.7	$ 0.0	$ 24.7	$ 6.9	$ 0.0	$ 6.9	28%	50%	28%	$ 31.6
	2.4	PVC Extrusions	$ 39.3	$ 0.2	$ 39.5	$ 15.6	$ 0.1	$ 15.7	40%	50%	40%	$ 55.2
	2.5	PVC Modules	$ 6.8	$ 2.8	$ 9.5	$ 2.2	$ 2.0	$ 4.3	33%	74%	45%	$ 13.8
	2.6	Electronics Production	$ 16.7	$ 0.5	$ 17.2	$ 8.2	$ 0.3	$ 8.5	49%	51%	49%	$ 25.6
	2.7	Data Acquisition System	$ 1.2	$ 0.6	$ 1.8	$ 0.6	$ 0.3	$ 0.9	50%	50%	50%	$ 2.7
	2.8	Near Detector Assembly	$ 0.2	$ 0.6	$ 0.8	$ 0.2	$ 0.6	$ 0.8	100%	100%	100%	$ 1.6
	2.9	Far Detector Assembly	$ 7.1	$ 7.3	$ 14.5	$ 7.1	$ 7.3	$ 14.5	100%	100%	100%	$ 28.9
	2.10	Project Management	$ 0.6	$ 4.3	$ 4.9	$ -	$ -	$ -	0%	0%	0%	$ 4.9
		Subtotal Construction	**$ 160.1**	**$ 19.8**	**$ 179.9**	**$ 57.6**	**$ 11.7**	**$ 69.3**	**36%**	**59%**	**39%**	**$ 249.2**
		PED*	$ 7.2	$ 1.4	$ 8.7	$ 1.6	$ 0.4	$ 2.0	22%	29%	23%	$ 10.6
		Total TEC:	**$ 167.4**	**$ 21.2**	**$ 188.6**	**$ 59.1**	**$ 12.1**	**$ 71.3**	**35%**	**57%**	**38%**	**$ 259.8**
OPC		**R&D**	$ 5.8	$ 6.5	$ 12.3	$ 0.7	$ 0.6	$ 1.3	12%	9%	10%	$ 13.6
		Total OPC:	**$ 5.8**	**$ 6.5**	**$ 12.3**	**$ 0.7**	**$ 0.6**	**$ 1.3**	**12%**	**9%**	**10%**	**$ 13.6**
		TPC:	**$ 173.2**	**$ 27.7**	**$ 200.9**	**$ 59.8**	**$ 12.7**	**$ 72.5**	**35%**	**46%**	**36%**	**$ 273.4**

Note: *PED activities in the schedule are not currently segregated from construction activities.

Committee's Cost & Contingency Estimate

	WBS	Items	Committee's Cost Estimate AY$ $M									
			Base w/Indirects			Contingency $			Contingency %			Total Base w/Indirects and Cont.
			M&S	Labor	Total	M&S	Labor	Total	M&S	Labor	Total	
TEC	2.1	Far Detector Site and Buildings			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.1	Liquid Scintillator			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.3	Wave-Length-Shifting Fiber			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.4	PVC Extrusions			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.5	PVC Modules			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.6	Electronics Production			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.7	Data Acquisition System			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.8	Near Detector Assembly			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.9	Far Detector Assembly			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
	2.10	Project Management - Construction			$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
		Subtotal Line Item	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**$ -**
	PED				**$ -**			**$ -**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**$ -**
		Total TEC:	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**$ -**
OPC	**R&D**				$ -			$ -	#DIV/0!	#DIV/0!	#DIV/0!	$ -
		Total OPC:	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**$ -**
		TPC:	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**$ -**

Notes: